

the period of greatest intensity of the Aleutian low. Moderate to fresh gales occurred in the Gulf of Alaska on several days—at the head of the gulf on the 8th, 10th, 11th, 17th, and 18th, as observed by the American S. S. *Northwestern*; and over the south-central and eastern portions on the 1st, 8th, and 22d. The Aleutian off-shooting low which caused the gales on the 8th passed into the Canadian Northwest on the 9th.

Northwest gales occurred near the coast of California on the 5th and 6th, and rising as they did to a force of 10, as noted by the American S. S. *H. F. Alexander*, constituted the strongest winds of the month outside of the Tropics. Moderate northeast gales also occurred near the same coast on the 21st, and farther at sea on the San Francisco-Hawaii route on the 20th and 22d.

### INDIAN AND SOUTH PACIFIC OCEANS

By ALBERT J. McCURDY, JR.

*Arabian Sea*.—Weather reports received from vessels that crossed the Arabian Sea during July indicate a moderate activity of the southwest monsoon in that month. The average wind force was 5, and moderate to fresh gales were experienced on somewhat more than one-fourth of the days.

The Dutch S. S. *Menado*, Capt. R. Borst, Suez to Colombo via Djibouti, encountered on the 6th a moderate southwesterly gale accompanied by high seas. Mr. W. J. Klijn, observer, reports that the lowest pressure observed was 29.66 inches (uncorrected), occurring at 3:40 p. m., in 12° 37' N., 55° E. The wind at this time was SW. by S., force 7, and decreased by 10 p. m. to a fresh SW. breeze.

On the same date the British S. S. *Suncliff*, Capt. H. J. Case, Colombo to Port Sudan, encountered a southwesterly gale in 5° 51' N., 52° 28' E. Mr. A. Horey, third officer, states that the lowest barometer, 29.83 inches, was recorded about 3 p. m. on the 6th. The wind at this time was SW., force 7, thence increased to a fresh gale on the following day, accompanied by high confused seas that lasted until 1 a. m. of the 8th.

From the 15th to 18th the British S. S. *Slavic Prince*, Capt. C. W. Chambers, Penang to Aden, experienced southwesterly winds of force 7 to 8, accompanied by very heavy seas. Mr. W. C. Freeman, second officer, states that the lowest barometer recorded was 29.64 inches (uncorrected), occurring at 3:45 p. m., on the 18th, in 12° 54' N., 57° 15' E.

On the 23d the Dutch S. S. *Kawi*, Capt. E. P. Ross, Sabang to Perim, experienced a southwesterly gale south of Sokotra, reporting conditions similar to those experienced by the *Slavic Prince*. The lowest pressure was 29.73 inches (uncorrected), occurring at 4 p. m., on the 23d in 10° 30' N., 51° 22' E. At this time the wind was SW., force 7, gradually shifting toward the south.

*South Pacific Ocean*.—The only gale of any consequence reported in the South Pacific for this month was a disturbance in the vicinity of New Zealand that appeared on July 21, and which until the 26th occasioned moderate to strong gales with accompanying high seas. The British S. S. *Orowaiti*, Capt. W. H. Smith, Wellington to San Luis Obispo, came within its influence on the 21st. The observer, Mr. C. R. Smith, is quoted as follows:

Gale commenced in early morning of the 21st and increased till midnight. Wind shifted from S. to SW., after rounding Cape Palliser. Wind just blew itself out.

23d–25th. The worst and heaviest wind and sea were experienced between 4 and 8 a. m., on the 25th, which was sometime after lowest barometer. There were no sudden changes of wind.

The lowest barometer recorded was 29.52 inches, occurring at 4 p. m. on the 24th, in 29° S., 172° 51' W. The wind at this time was northerly, force 9. The gale lasted throughout the evening of the 25th, and during that time the wind shifted to the SW.

From the 24 to 26th this same gale was experienced by the British S. S. *Maunganui*, Capt. L. C. H. Worsall, Wellington to Rarotonga. Mr. W. Johnson, observer, reports that the lowest barometer noted was 29.47 inches (uncorrected), occurring at 2 p. m. on the 24th, in 31° 31' S., 171° 40' W. The wind at this time was SE., force 8, later shifting to NW., thence to W. by S., force 8, with a steadily rising barometer.

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### DETAILS OF THE WEATHER IN THE UNITED STATES

#### GENERAL CONDITIONS

By ALFRED J. HENRY

Anticyclones (HIGHS) that drifted slowly across the continent toward the southeast appeared to dominate the weather of the month in the great majority of districts. As a whole, the month was cool and dry, although areas in Florida, the lower Mississippi Valley, and the northern Rocky Mountain Plateau had above-normal temperature. The rainfall was irregularly distributed; more than the normal fell along the Atlantic coast south of the Virginia capes, also locally in the Lake region and the middle Mississippi Valley. In general, however, the rainfall in the great majority of localities was below the normal, the shortage being especially noticeable in the lower Mississippi Valley and the western Gulf States. The usual details follow:

#### CYCLONES AND ANTICYCLONES

By W. P. DAY

The general movement of the centers of cyclones during the month of July was eastward across the northern United States, and Canada (within the limits of observation).

However, the low-pressure systems crossing the field of observations were mostly of the trough formation and sometimes without the usual accompanying cyclonic circulation. The weather over the Southern States was entirely dependent on the day-to-day displacements of these troughs or lines of discontinuity.

The anticyclones, on the other hand, were generally more prominent and retained their identities over considerable periods, notably the Alberta HIGHS which were on the weather chart at the beginning and at the end of the month.

#### FREE-AIR SUMMARY

By V. E. JAKL, Meteorologist

The average free-air conditions for the month, as determined by kites and given in Tables 1 and 2, showed, with no important exceptions, close agreement with the normal for all sections of the country represented by the six fully equipped aerological stations. The most noticeable departure is in temperature, in which respect the month was generally slightly cooler than normal, although the departures were not of a decided nature ex-

cept over the northern stations. At Drexel, Ellendale, and Royal Center, the departure varied between 1° and 2° C. below normal at all levels for which reliable averages were obtained.

While no important departures are noted for any station, interest attaches to a comparison of the records at the different stations, particularly in relation to the surface weather conditions that prevailed. The records of two adjoining stations, viz, Broken Arrow and Groesbeck, may be cited as an example. Upper-air conditions undoubtedly bore some relation to the wide divergence in the precipitation recorded at these stations. Frequent thunderstorms and considerable precipitation at Broken Arrow was in marked contrast to the weather prevailing at Groesbeck, 300 miles to the south, where measurable amount of rain fell on only one day. The tabulated data indicate that important differences prevailed between the free-air wind resultants and average humidities over these two stations. A more westerly component in the upper levels is shown over Broken Arrow than over Groesbeck, although it is more pronounced in the pilot balloon observations, as the resultants for the higher levels shown in Table 2 are based on but few kite observations. The somewhat opposed winds at the two stations and their greater strength at Broken Arrow may be attributed to the fact that Groesbeck was largely under the influence of stagnant HIGHS during the month, while Broken Arrow frequently lay in the path of LOWS and moving HIGHS, which, however, did not extend their influence to the Gulf. The significance of the humidity records appears to lie in the average low values found over Groesbeck in all but the lower levels, while on the other hand high humidities were prevalent over Broken Arrow at all levels.

The following table, showing a comparison of upper-air observations at Broken Arrow and Groesbeck on the 18th, has been selected as typical of a number of days on which precipitation occurred at Broken Arrow, and kite flights were made nearly simultaneously at both stations. In the record of the observation at Broken Arrow, made soon after the occurrence of heavy precipitation, it will be noted that the wind veered and increased in strength with altitude, and that there was a practically unbroken lapse rate in temperature. Also, the humidity averaged high in the various strata. At Groesbeck the winds were uniformly from a southerly direction, and generally of light to moderate force, while an inversion in temperature at a moderate altitude coincided with an abrupt change to low humidity that prevailed to the upper limit of observation. These conditions at the two stations can be reconciled with their respective positions relative to surrounding pressure distribution. The upper-air conditions and precipitation at Broken Arrow were characteristic of its position relative to a fairly well defined low, being successively to the east and south of the trough center. The effects of this low did not penetrate south to Groesbeck, which was under the influence of a dormant HIGH. In fact, the free-air conditions observed at Groesbeck on this date were quite typical of the month, as will be noted by comparing with the averages for that station given in Tables 1 and 2. Furthermore, as the dryness of the month noted at Groesbeck with its accompanying pressure conditions extended over the West Gulf region it is probable that the average upper-air conditions at Groesbeck during the month are characteristic of moderate altitudes in the rear of stagnant HIGHS.

*Meteorological conditions over Broken Arrow, Okla., and Groesbeck, Tex., on July 18, 1924*

Station and time	Altitude, m. s. l.	Temperature	Relative humidity	Wind direction	Wind velocity
	<i>meters</i>	<i>°C.</i>	<i>Per cent</i>		<i>m. p. s.</i>
Broken Arrow:					
10:01 a. m. ....	1,233	24.4	93	SSE	9
10:03 a. m. ....	522	23.1	93	SSE	17
10:08 a. m. ....	656	24.0	67	SSE	12
10:27 a. m. ....	1,728	19.4	61	SSW	10
10:58 a. m. ....	3,415	8.2	100	W	14
11:08 a. m. ....	4,219	3.1	65	WSW	20
11:16 a. m. ....	4,330	1.6	81	WSW	16
Groesbeck:					
10:07 a. m. ....	1,141	30.3	57	SSW	8
10:15 a. m. ....	607	25.1	75	SSW	9
10:34 a. m. ....	1,409	18.6	91	SSW	11
10:44 a. m. ....	1,852	19.3	44	SSW	6
11:15 a. m. ....	2,211	18.5	40	SSW	6
11:41 a. m. ....	3,328	11.1	31	SSW	8

<sup>1</sup> Surface.

A good illustration of the effects of pronounced vertical currents is given in the kite and double theodolite pilot balloon observations made at Ellendale on the 14th, which on that date was situated on the north edge of a high pressure area. The balloon observation, which extended to 5,000 meters altitude in a general westerly wind, showed marked convectional activity in the lower half of the air column. By comparing the actual ascensional rate of the balloon with the standard rate to which it was inflated, it was found that in the lower 2,400 meters it was carried along in a column of ascending air that had an average vertical velocity of 2.7 meters per second, with a maximum velocity about midway of this column of approximately 5.3 meters per second. Above 2,400 meters the ascensional rate of the balloon was retarded for a few hundred meters, but thereafter to the upper limit of observation the standard ascensional rate obtained. A kite flight made a few hours earlier, the record of which is given in the following table, showed increasing humidity from the ground up to the level of cumulus clouds at about 2,100 meters from the surface, above which much drier air prevailed.

*Meteorological conditions over Ellendale, N. Dak., on July 14, 1924*

Time	Altitude, m. s. l.	Temperature	Relative humidity	Wind direction	Wind velocity
	<i>Meters</i>	<i>°C.</i>	<i>Per cent</i>		<i>m. p. s.</i>
10:17 a. m. ....	8,557	3.1	27	WNW	8
10:31 a. m. ....	2,836	6.5	21	WNW	7
10:34 a. m. ....	2,493	5.4	89	WNW	7
10:54 a. m. ....	1,826	9.6	73	WSW	7
11:21 a. m. ....	1,826	18.6	48	WSW	8
11:28 a. m. ....	1,444	26.0	42	SW	5

<sup>1</sup> Surface.

An illustration of the opposite effect of convectional action on a pilot balloon is given in the double theodolite observation made at Broken Arrow on the 10th, on which date Broken Arrow lay to the southwest of a high-pressure area. This observation showed a rather uniform ascensional rate of 42 meters per minute less than the standard inflation rate, up to 2,200 meters from the surface, above which the balloon ascended at slightly more than the standard rate. This retardation of the ascensional rate in the lower air column indicated a descending current of about 0.7 meter per second, or 1.6 miles per hour which was undoubtedly of a convectional nature, as the indicated rate was too large to be attributed to the descent of air resulting from the assumed outflow from

the HIGH. This example and the one previously given well illustrate the vertical convective exchange of air typical of cumulus cloud formation. A commentary on these observations is that rising currents are much more frequently observed in double theodolite observations than descending currents, due to the fact that the latter are usually too weak to be definitely revealed in the records of observations. This leads to the conclusion that ascending currents are almost invariably smaller in cross section than their compensatory descending currents. In the observation last cited the winds in the lower levels embraced by the downward current were light easterly, above which they shifted abruptly to westerly, and finally to northwesterly in the very high altitudes. A velocity of 37 meters per second, or 83 miles per hour, was recorded at 11,500 meters, which was the highest velocity reported during the month in the observations of any pilot balloon station.

A pilot-balloon observation made at Broken Arrow on the 23d exceeded every previous record for length of time a balloon was followed by two theodolites, and with one exception, was a record in the United States for altitude to which a pilot balloon has been definitely known to ascend. This observation showed the balloon to have steadily ascended to 16,000 meters at a rate that for the most part agreed approximately with the standard or normal ascensional rate. At this altitude the balloon evidently became defective, as further observation showed an irregular rise and fall of the balloon for a prolonged period. The winds throughout this depth of altitude were general westerly of light velocity.

Winds at high altitudes having a decided easterly component were observed at most northern stations with more or less frequency from the 2d to the 6th. Over the most southerly stations easterly winds were frequent enough to give an east component at various altitudes in the resultants for the month. At Key West and San Juan there was a strong easterly component throughout the month for all levels represented by sufficient observation; while at Groesbeck the afternoon observations showed a decided northeasterly component at all levels above 5,000 meters. Over both the northern and the southern stations the easterly winds appear to have been associated with stationary or slow moving high-pressure areas. A high-pressure area that approached from the Canadian Northwest toward the last of June drifted slowly over the Eastern States during the first decade of July, with which fact may be connected the easterly winds observed whenever high altitudes were reached at

the northern stations during the first few days of the month. Over the Gulf States a condition of moderately high pressure persisted, with but little interruption, throughout the month.

TABLE 1.—Free-air temperatures, relative humidities, and vapor pressures during July, 1924

Altitude m. s. l. (m.)	TEMPERATURE (°C.)											
	Broken Arrow, Okla. (233 m.)		Drexel, Nebr. (396 m.)		Due West, S. C. (217 m.)		Ellendale, N. Dak. (444 m.)		Groesbeck, Tex. (141 m.)		Royal Center, Ind. (225 m.)	
	Mean	De- parture from 6-yr. mean	Mean	De- parture from 9-yr. mean	Mean	De- parture from 4-yr. mean	Mean	De- parture from 7-yr. mean	Mean	De- parture from 6-yr. mean	Mean	De- parture from 7-yr. mean
Surface	26.6	-0.3	21.8	-2.9	25.7	-1.0	20.1	-1.2	26.0	-0.7	23.7	-1.7
250	26.5	-0.3	21.8	-2.9	25.4	-1.0	19.9	-1.4	25.1	-0.7	23.3	-1.8
500	24.9	-0.3	21.6	-2.6	22.9	-1.1	19.6	-1.4	23.1	-0.8	20.3	-2.3
750	23.3	-0.4	20.6	-2.3	21.2	-1.0	18.1	-1.6	21.7	-1.0	18.7	-2.0
1,000	21.9	-0.3	19.7	-1.8	19.6	-0.8	17.1	-1.4	20.8	-0.8	17.0	-2.0
1,250	20.2	-0.4	18.5	-1.6	18.0	-0.7	16.0	-1.4	19.7	-0.6	15.4	-2.0
1,500	18.8	-0.2	17.3	-1.3	16.1	-0.9	14.6	-1.7	18.5	-0.4	13.8	-2.0
2,000	15.8	0.0	14.5	-1.0	12.8	-1.1	11.6	-2.0	16.6	+0.3	11.5	-1.5
2,500	12.7	+0.1	11.9	-0.4	9.3	-1.5	8.5	-2.1	14.4	+0.8	8.7	-1.6
3,000	9.5	+0.1	9.0	0.0	5.8	-1.9	6.2	-1.5	12.1	+1.2	5.8	-1.6
3,500	7.1	+0.5	6.2	+0.6	2.5	-2.0	3.5	-1.2	9.4	+1.5	1.9	-2.5
4,000	3.9	+0.5	3.8	+1.3	0.1	-1.5	0.5	-1.6	7.0	+2.2	-----	-----
4,500	0.8	+0.1	-0.7	+0.1	-1.4	-0.4	-1.5	-1.1	6.6	+3.4	-----	-----
5,000	-1.9	+0.1	-----	-----	-----	-----	-3.7	-0.6	4.6	+3.8	-----	-----

Altitude m. s. l. (m.)	RELATIVE HUMIDITY (%)											
	Broken Arrow, Okla. (233 m.)		Drexel, Nebr. (396 m.)		Due West, S. C. (217 m.)		Ellendale, N. Dak. (444 m.)		Groesbeck, Tex. (141 m.)		Royal Center, Ind. (225 m.)	
	Mean	De- parture from 6-yr. mean	Mean	De- parture from 9-yr. mean	Mean	De- parture from 4-yr. mean	Mean	De- parture from 7-yr. mean	Mean	De- parture from 6-yr. mean	Mean	De- parture from 7-yr. mean
Surface	67	-2	69	+4	67	0	60	-10	71	-3	69	+7
250	67	-2	69	+4	67	0	60	-10	72	-3	69	+7
500	64	-2	65	+2	70	+1	60	-9	73	-2	69	+5
750	64	-1	61	+1	72	+1	58	-6	70	0	69	+3
1,000	65	0	59	0	74	+1	55	-7	63	-3	73	+6
1,250	67	+1	58	0	76	+1	54	-6	59	-5	74	+7
1,500	66	0	55	-2	78	+4	55	-3	57	-6	74	+7
2,000	65	+1	55	0	79	+6	57	+1	51	-10	64	+2
2,500	65	+4	52	-1	80	+7	53	-1	48	-11	66	+9
3,000	66	+6	53	+1	78	+6	42	-9	48	-10	62	+9
3,500	62	+4	51	-1	79	+10	37	-14	52	-6	63	+15
4,000	56	+1	42	-8	75	+13	33	-18	46	-14	-----	-----
4,500	57	+6	46	-6	61	+10	24	-32	19	-17	-----	-----
5,000	62	+8	-----	-----	-----	-----	16	-35	17	-16	-----	-----

Altitude m. s. l. (m.)	VAPOR PRESSURE (mb.)											
	Broken Arrow, Okla. (233 m.)		Drexel, Nebr. (396 m.)		Due West, S. C. (217 m.)		Ellendale, N. Dak. (444 m.)		Groesbeck, Tex. (141 m.)		Royal Center, Ind. (225 m.)	
	Mean	De- parture from 6-yr. mean	Mean	De- parture from 9-yr. mean	Mean	De- parture from 4-yr. mean	Mean	De- parture from 7-yr. mean	Mean	De- parture from 6-yr. mean	Mean	De- parture from 7-yr. mean
Surface	23.30	-0.89	18.16	-1.80	21.50	-1.61	13.97	-3.51	23.76	-1.79	20.36	+0.50
250	23.06	-0.90	18.16	-1.80	21.23	-1.54	13.97	-3.51	23.02	-1.56	19.89	+0.30
500	20.03	-0.90	17.10	-1.83	19.18	-1.08	13.53	-3.38	20.79	-1.36	16.57	-0.73
750	18.13	-0.61	15.22	-1.49	17.89	-0.78	11.97	-2.62	18.06	-1.22	14.99	-0.63
1,000	16.76	-0.34	13.94	-1.22	16.71	-0.56	10.72	-2.33	15.33	-1.52	14.25	-0.09
1,250	15.58	-0.02	12.73	-1.05	15.72	-0.22	9.74	-1.94	13.41	-1.63	12.92	0.00
1,500	14.19	+0.14	11.23	-1.17	14.30	+0.12	9.14	-1.25	11.99	-1.63	11.53	-0.09
2,000	11.57	+0.44	9.31	-0.62	11.54	+0.10	7.74	-0.66	9.57	-1.64	8.27	-0.47
2,500	9.31	+0.52	7.26	-0.58	9.11	-0.16	5.97	-0.88	7.91	-1.30	7.10	+0.63
3,000	7.38	+0.52	6.05	-0.07	6.87	-0.55	4.06	-1.38	6.88	-0.82	5.68	-0.71
3,500	5.95	+0.43	4.37	-0.39	5.64	+0.07	3.04	-1.47	6.05	-0.38	4.34	+0.61
4,000	4.04	-0.01	3.07	-0.62	4.40	+0.53	2.42	-1.31	4.57	-0.83	-----	-----
4,500	3.47	+0.48	2.36	-0.68	3.24	+0.48	1.87	-1.68	2.68	-0.09	-----	-----
5,000	3.25	+0.48	-----	-----	-----	-----	1.43	-1.72	2.44	-0.83	-----	-----

TABLE 2.—Free-air resultant winds (m. p. s.) during July, 1924

Altitude, m. s. l. (m.)	Broken Arrow, Okla. (233 meters)				Drexel, Nebr. (396 meters)				Due West, S. C. (217 meters)				Ellendale, N. Dak. (444 meters)				Groesbeck, Tex. (141 meters)				Royal Center, Ind. (225 meters)			
	Mean		6-year mean		Mean		9-year mean		Mean		4-year mean		Mean		7-year mean		Mean		6-year mean		Mean		7-year mean	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Surface	S. 7° W.	4.1	S. 1° W.	3.2	S.	1.6	S. 1° W.	2.2	N. 22° E.	1.3	S. 67° W.	1.0	S. 30° W.	0.7	S. 13° E.	0.2	S. 17° W.	3.1	S. 10° W.	3.3	N. 88° W.	2.0	S. 81° W.	1.6
250	S. 7° W.	4.3	S. 1° W.	3.3	S.	1.6	S. 1° W.	2.2	N. 17° E.	1.3	S. 69° W.	1.1	S. 30° W.	0.7	S. 13° E.	0.2	S. 16° W.	3.8	S. 21° W.	4.2	S. 88° W.	2.1	S. 80° W.	1.8
500	S. 15° W.	7.3	S. 11° W.	4.7	S. 7° E.	2.4	S. 3° W.	3.0	N. 5° W.	1.4	S. 78° W.	1.7	S. 16° W.	1.5	S. 10° E.	0.6	S. 13° W.	5.2	S. 28° W.	5.8	S. 61° W.	4.0	S. 71° W.	3.2
750	S. 18° W.	7.9	S. 20° W.	5.1	S. 4° E.	3.5	S. 16° W.	4.2	N. 20° W.	1.2	S. 87° W.	2.2	S. 27° W.	2.7	S. 11° W.	1.5	S. 10° W.	5.8	S. 29° W.	6.8	S. 61° W.	4.7	S. 70° W.	4.0
1,000	S. 27° W.	7.9	S. 27° W.	4.9	S. 14° W.	3.8	S. 24° W.	4.5	N. 46° W.	1.9	S. 87° W.	2.4	S. 46° W.	3.2	S. 36° W.	2.0	S. 12° W.	5.9	S. 30° W.	6.5	S. 61° W.	5.1	S. 74° W.	4.6
1,250	S. 28° W.	7.6	S. 31° W.	4.8	S. 28° W.	4.1	S. 35° W.	4.6	N. 74° W.	3.0	S. 83° W.	2.6	S. 57° W.	3.5	S. 52° W.	2.3	S. 17° W.	5.3	S. 32° W.	5.2	S. 66° W.	5.4	S. 70° W.	5.2
1,500	S. 37° W.	7.4	S. 35° W.	4.8	S. 44° W.	4.4	S. 42° W.	4.1	N. 78° W.	4.4	S. 85° W.	3.8	S. 65° W.	3.9	S. 62° W.	2.9	S. 10° W.	5.1	S. 31° W.	4.8	S. 78° W.	7.5	S. 83° W.	5.9
2,000	S. 43° W.	5.5	S. 35° W.	4.0	S. 53° W.	5.1	S. 55° W.	5.0	N. 86° W.	9.4	S. 84° W.	5.1	S. 76° W.	4.7	S. 79° W.	4.3	S. 17° W.	3.7	S. 32° W.	3.9	S. 89° W.	9.3	S. 86° W.	7.0
2,500	S. 58° W.	5.4	S. 46° W.	4.2	S. 70° W.	6.0	S. 70° W.	5.4	N. 86° W.	9.7	S. 87° W.	5.9	S. 87° W.	6.1	N. 89° W.	5.9	S. 22° W.	3.3	S. 31° W.	3.5	N. 80° W.	10.9	W.	9.4
3,000	S. 68° W.	4.9	S. 58° W.	4.7	S. 72° W.	5.9	S. 70° W.	6.3	N. 81° W.	8.2	S. 87° W.	7.5	S. 85° W.	7.9	W.	7.6	S. 30° W.	3.1	S. 26° W.	3.4	N. 72° W.	13.2	S. 87° W.	11.7
3,500	S. 85° W.	4.9	S. 70° W.	4.8	S. 78° W.	6.8	S. 72° W.	7.3	N. 84° W.	7.9	N. 89° W.	7.3	N. 87° W.	9.0	N. 79° W.	9.6	N. 69° W.	3.8	S. 19° W.	1.9	W.	11.3	S. 83° W.	11.3
4,000	S. 54° W.	12.1	S. 55° W.	8.2	S. 86° W.	11.1	S. 76° W.	7.4	N. 81° W.	8.2	N. 79° W.	7.6	N. 79° W.	10.3	N. 72° W.	10.8	N. 36° W.	7.5	N. 55° W.	1.0	W.	17.6	N. 76° W.	9.5
4,500	S. 47° W.	13.8	S. 37° W.	10.9	N. 62° W.	11.7	S. 66° W.	7.7	W.	8.2	W.	8.6	N. 15° W.	15.2	N. 64° W.	13.1	N. 22° W.	8.7	N. 25° E.	5.5	-----	-----	-----	-----
5,000	S. 22° W.	14.2	S. 10° E.	11.4	-----	-----	-----	-----	W.	7.3	W.	7.4	N. 45° W.	17.5	N. 67° W.	16.0	N. 23° W.	8.8	N. 35° E.	2.9	-----	-----	-----	-----